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EXAMINER

HARAN, JOHN T

ART UNIT	PAPER NUMBER
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1733

DATE MAILED: 04/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/890,066

**Applicant(s)**

NISHIDA ET AL.

**Examiner**

John T. Haran

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 February 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 72-80,82-105,107 and 109-142 is/are pending in the application.
- 4a) Of the above claim(s) 97 and 109-124 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 72-80,82-96,100-105 and 107 is/are rejected.
- 7) ☒ Claim(s) 98 and 99 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 July 2001 and 05 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>1/27/04</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This action is in response to the amendment filed on 2/13/04.

#### ***Election/Restrictions***

2. Newly submitted claim 109-124 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

Claims 109-124 are restrictable from the originally elected group (Group VI) and from newly added claims 76-108 and 124-142. Claim 109 and 76 share all the same technical features except that claim 109 has the special technical feature that the same device shapes the tip of the bump and bonds the chip to the electrode. The commonly shared technical features of claims 76 and 109 are known as evidenced by Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) (see rejection of claim 76 below). Accordingly if claims 76 and 109 had been originally presented they would have been restricted for a lack of unity for not possessing the same special technical feature.

3. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 109-124 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

4. It is also noted that claim 97 is withdrawn since it should have been cancelled in response to the previous nonresponsive amendment since it deals with conductive particles which were restricted out from the elected group.

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***Information Disclosure Statement***

5. The information disclosure statement (IDS) submitted on 1/27/04 has been considered by the examiner.

***Drawings***

6. The drawing changes received on 11/05/04 are approved.

***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 76-96 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 76 requires shaping a tip of said bump without collapsing the bump by applying a load of not greater than 20gf to said bump by pressing the bump against the second electrode without leveling said bump. There is inadequate description in the specification of how the tip of the bump can be shaped without leveling bump. It would appear that shaping the tip by pressing it against the second electrode would necessarily lead to flattening (leveling) the tip of the bump and therefore flatten (level) the bump. Accordingly, absent such a description one skilled in the art would not be

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enabled to shape the tip by pressing it against the second electrode without leveling the bump. Additionally, there is inadequate description of the desired end shape of the tip of the bump, which further hampers one skilled in the art to be enabled to shape the tip of the bump by pressing it against the second electrode without leveling said bump. It is noted that the specification appears to discuss this method in the fourth embodiment (pages 69-73) but the description is inadequate to address the above mentioned concerns.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 76-96 and 134 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 76 is indefinite because it is entirely unclear how the tip of the bump can be shaped by pressing it against the second electrode with a load of less than 20 gf while at the same time not leveling the bump. It would appear that shaping the tip by pressing it against the second electrode would necessarily lead to flattening (leveling) the tip of the bump and therefore flatten (level) the bump. Clarification is requested.

Claim 134 is indefinite because it is dependent on a cancelled claim 106.

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***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 72-75, 103, 125, 127, and 131 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549).

Nishida teaches an electronic component mounting method and apparatus wherein a ball is formed at a tip of metal wire and is formed into a bump by bonding the ball to an electrode of electronic component; mounting the electronic component on a circuit board while aligning the electrode of the electronic component with an electrode of the board with an insulative thermosetting resin mixed with inorganic filler interposed in between and the mounting occurs without leveling the formed bump; and the electronic component is subsequently bonded to the circuit board by hardening the thermosetting resin sheet while correcting the warp of the board and crushing the bump with a pressure force of not smaller than 20 gf per bump by means of a tool and heat is applied with the bonding tool so that electrodes of the component and board are electrically connected via the bump (See Columns 13 and 14; Figures 1-4). Nishida teaches shaping the tip of the bump without collapsing the bump (See Figures 2E and 2F), but is silent towards whether a load of not greater than 20 gf is applied to the bump

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in the process and is also silent towards the bonding being thermocompression bonding. It is noted that EP 0954208 is relied upon as an English translation of Nishida (WO 98/30073).

Higashi et al, is an example of the well known and conventional means of forming a bump on an electrode, similar to that taught in Nishida, wherein a gold wire in a capillary is subjected to an electric discharge to form a ball at the end of the wire and then forming the ball into a bump by thermocompression-bonding with supersonic waves by means of a capillary to an electrode (Column 9, line 59 to Column 10, line 28 and Column 13, lines 42-57). Next the tip of the bump is shaped by attaching the end of the wire to the bump by application of supersonic waves wherein the capillary contacts the bump with a force that is insufficient to damage the bump (Column 10, lines 39-45; Column 11, lines 1-5; Figures 1A-1C). One skilled in the art would have readily appreciated that the load applied by the capillary is sufficient to shape the tip and at the same time does not collapse the ball and is less than 20gf since both the present application and Nishida teach that a force of 20gf or greater deforms the bump (Column 13, lines 42-58). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the bump and shape the tip using the well known and conventional method suggested in Higashi et al in the method of Nishida.

Regarding claim 103, Nishida is silent towards the mean particle diameter of the inorganic filler, but one skilled in the art would have readily appreciated that such is within the purview of one skilled in the art and would depend upon a variety of factors. It would have been obvious to have the mean particle diameter be at least 3 $\mu$ m.

Regarding claim 127, one skilled in the art would have readily appreciated that the product claimed in 127 is not patentably distinct from that claimed in claim 125.

13. Claims 104, 105, 107, 132, 133, and 135 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) as applied to claims 72-75 above, and further in view of Kaneda et al (U.S. Patent 6,223,429).

Nishida et al is silent towards the thermosetting insulating resin sheet filled with an inorganic filler having a plurality of types of inorganic fillers. It is noted that Nishida also teaches use anisotropic adhesive filled with conductive particles such as nickel (which is inorganic) but is silent towards the resin having a plurality of types of inorganic filler (Column 15, lines 39-41).

Kaneda et al teaches an anisotropic conductive film comprising an insulative adhesive filled with electrically conductive inorganic particles such as nickel, gold, silver or copper, (Column 6, lines 31-33) and other inorganic filler particles in order to reduce thermal expansion problems (Column 5, lines 16-24). The two types of inorganic particles have different mean particle diameters and one is clearly twice the size of the other (See Figure 2). Kaneda teaches that the insulating resin has two layers one with inorganic filler particles that is adjacent the chip and one with the conductive particles that is adjacent the substrate (Column 2, line 60 to Column 3, line 2). It is clear from Figure 2 that the different layers have differing amounts of the different particles. It would have been obvious to one of ordinary skill in the art at the time the invention was

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made to use the anisotropic film of Kaneda in the method of Nishida et al in order to reduce thermal expansion problems during heating and bonding as suggested in Kaneda et al.

14. Claims 100 and 128 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) as applied to claims 72-75 above, and further in view of Kim (U.S. Patent 5,407,864).

Nishida is silent towards applying supersonic waves when bonding the bump attached to the chip to the electrode on the circuit board, however such is a well known and conventional bonding technique in the art as shown for example in Kim (Column 1, lines 35-44). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use supersonic waves to bond the bump to the electrode on the circuit board in the method of Nishida as is well known and conventional in the art as suggested in Kim.

15. Claims 101 and 129 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) as applied to claims 72-75 above, and further in view of Davis et al (U.S. Patent 6,589,376).

Nishida is silent towards the resin being applied as a liquid to the circuit board and subsequently hardened, however such is well known and conventional in the art as shown for example in Davis et al (See Figure 1). It would have been obvious to one of ordinary skill in the art to apply the resin in a liquid form to the substrate and

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subsequently harden it in the method of Nishida as is well known and conventional in the art as evidenced in Davis et al.

16. Claims 102 and 130 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) as applied to claims 72-75 above, and further in view of Davis et al (U.S. Patent 6,589,376) as applied to claim 101 above, and further in view of Lyden (U.S. Patent 4,811,081).

Davis teaches that the liquid resin is partially cured using heat while the chip is in contact with the resin and is silent towards partially curing the resin with heat first and then contacting the chip to the adhesive. It is well known and conventional in the art to contact a chip to a partially cured (B-staged adhesive) when bonding the chip to a substrate as shown for example in Lyden (Column 3, lines 53-60). One skilled in the art would have readily appreciated that the chips can be adhered to a substrate through a partially cured resin either by placing the chip in contact with an already partially cured resin or in contact with a liquid resin that is then partially cured and that the two are alternate expedients obvious over one another. One skilled in the art also would have readily appreciated using any known heat source, such as a furnace, to partially cure the resin with heat. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the resin as a liquid and to partially cure through heating in a furnace prior to contact the chip to the resin in the method of Nishida, as modified above, as suggested in Davis and Lyden.

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17. Claims 76-80, 82-85, 96, and 136-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) as applied to claims 72-75 above, and further in view of Takeshita et al (U.S. Patent 6,458,236).

Nishida is silent towards shaping the tip of the bump by pressing the bump against a second electrode.

Takeshita is directed to a method of mounting electrical parts on a substrate wherein a pressure head is brought into light contact with an electrical part positioned on a substrate and then subsequently the pressure applied by the pressure head is gradually increased to supply sufficient pressure to bond the electrical part to the substrate (Column 5, line 34 to Column 6, line 22). Takeshita also teaches that the pressure head is initially brought into light contact and the pressure is gradually increased in order to maintain a parallelism between the flat surface of the pressure head and the flat surface of the substrate (Column 5, lines 47-65). One skilled in the art would have readily appreciated that Takeshita is directed to maintaining the parallelism in order to apply an even distribution of pressure in order to minimize warping of the substrate and that the initial light contact would provide sufficient force to shape the tip of a bump on the electrode of an electrical part without collapsing the bump by pressing it against a second electrode on the substrate. One skilled in the art also would have readily appreciated that the force of the light contact would be less than 20gf. Additionally as noted above, it is unclear how the tip is shaped by pressing the bump against a second electrode without leveling the bump, but it is taken that the initial light

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contact would work, since that is how application describes achieving such. It would have been obvious to one of ordinary skill in the art to initially lightly contact a pressure head against the chip, thereby pressing the bump against a second chip and shaping the tip of the bump with a load less than 20gf without collapsing or leveling the bump, in the method of Nishida in order to achieve the desired parallelism taught in Takeshita and to minimize warpage.

Regarding claims 77- 79, Nishida teaches bonding by applying a load of greater than 20 gf with a heated bonding tool in order to deform the bump and heating the resin while applying the pressure in order to harden the resin and that the heating and pressing corrects warpage in the circuit board (Column 13, lines 50-58 and Column 14, lines 49-52).

Regarding claim 80, Nishida teaches heating the electronic component side of the insulating resin via the heated bonding tool, but one skilled in the art would have readily appreciated the resin could have been heated through the circuit board or through both the circuit board and the chip. The choices are alternate expedients obvious over one another and within the purview of one skilled in the art.

Regarding claim 82, Nishida teaches having an epoxy resin with an inorganic filler (Column 13, lines 34-36), however is silent towards the weight percentage of the filler. One skilled in the art would have readily appreciated that the weight percentage would depend upon the materials worked upon and that the weight percentage of the inorganic filler would have been within the purview of one skilled in the art.

Regarding claims 83-84, Nishida teaches the thermosetting resin being smaller in dimension than the area defined between the inner edges of the two electrodes on the chip (Column 4, lines 17-25).

Regarding claim 85, Higashi teaches using a capillary with a chamfer angle of 90 degrees and a nonflat tip to form a bump with a gold wire with a conical tip (Column 11, lines 23-26, Figures 1A-1C). It would have been obvious to use such conventional techniques in the method of Nishida.

Regarding claim 96, Nishida teaches the inorganic filler being silica (Column 13, lines 35-36) and one skilled in the art would have readily appreciated the silica is either spherical or pulverized. Furthermore, one skilled in the art would have readily appreciated that silica is exemplary and it would have been obvious to use similar inorganic fillers. It would have been obvious to use inorganic fillers that are pulverized or spherical silica or the like in the method of Nishida.

18. Claims 86-95 and 139-142 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (WO 98/30073) in view of Higashi et al (U.S. Patent 6,207,549) as applied to claims 72-75 above, and further in view of Takeshita et al (U.S. Patent 6,458,236) as applied to claims 76-80, 82-85 and 96 above, and further in view of Kaneda et al (U.S. Patent 6,223,429).

Regarding claim 86, Nishida et al is silent towards the thermosetting insulating resin sheet filled with an inorganic filler having a plurality of types of inorganic fillers. It is noted that Nishida also teaches use anisotropic adhesive filled with conductive

particles such as nickel (which is inorganic) but is silent towards the resin having a plurality of types of inorganic filler (Column 15, lines 39-41).

Kaneda et al teaches an anisotropic conductive film comprising an insulative adhesive filled with electrically conductive inorganic particles such as nickel, gold, silver or copper, (Column 6, lines 31-33) and other inorganic filler particles in order to reduce thermal expansion problems (Column 5, lines 16-24). The two types of inorganic particles have different mean particle diameters (See Figure 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the anisotropic film of Kaneda in the method of Nishida et al in order to reduce thermal expansion problems during heating and bonding as suggested in Kaneda et al.

Regarding claims 87-88 and 91-92 Kaneda teaches that the insulating resin has two layers one with inorganic filler particles that is adjacent the chip and one with the conductive particles that is adjacent the substrate (Column 2, line 60 to Column 3, line 2). It is clear from Figure 2 that the different layers have differing amounts of the different particles.

Regarding claims 89, 93, and 94, one skilled in the art would have readily appreciated choosing the resin to bond well to both the chip and the substrate in order to ensure adequate adhesion.

Regarding claims 90 and 95, Kaneda teaches the inorganic filler particles are present only in the first layer (See Figure 2).

***Double Patenting***

19. Applicant is advised that should claim 125 be found allowable, claims 126, 127, 128, 129 and 130 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

It is noted that the patentability of product by process claims is based on the product itself and not on its method of production (MPEP 2113). Accordingly claims 125-130 result in the same product even though they have different method steps. Absent any showing that the additional method steps result in a materially different product the claims are considered duplicates.

***Allowable Subject Matter***

20. Claims 98 and 99 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record fails to suggest the claimed method for mounting an electronic component, particularly the claimed steps of applying a first pressure to the electronic component while applying heat to the resin and then while no longer applying

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the first pressure, applying a second pressure to the electronic component wherein the second pressure is less than the first pressure.

Takeshita et al teaches applying a first pressure when bonding an electronic component to a circuit board and then applying a second pressure, however the second pressure is greater than the first pressure (Column 6, line 60 to Column 7, line 20). There is no suggestion for the second pressure to be less than the first pressure.

### ***Response to Arguments***

22. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

23. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


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24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(571) 272-1217**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
John T. Haran

  
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GPO 17-220